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Research paper



Mobile Learning as a New E-Learning Strategy

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Abstract

Mobile learning (M-learning) entails e-learning method. As a new phase of distance learning, M-learning assists the distance learning environment, decreasing the confines of the customary education. The present study discusses the presently employed devices and techniques for the accomplishment of the mobile learning target. It is concluded in this study that the use of wireless apparatus in Wi-Fi environment will consistently increase the desire to employ M-Learning technology.

Keywords: *M-Learning, E-Learning, Distance Learning.*

1. Introduction

Conventional education or direct education involves the use of classroom in the provision of educational materials by an educator to a group of learners. Essentially, educational technology is grounded upon the physical partaking of educator and learners during the process of learning. Direct contact between educator and learners, and instantaneous feedback brings obvious benefits. However, there are disadvantages that have been linked to the traditional classroom teaching and learning. As an example, there are situations that would impede learner from physically partaking in the classroom lesson, causing the learner to be left behind in regards to the training material. Hence, innovative and more effective teaching methods need to be established.

The use of the Internet in educational institutions began in the 70s. Initially, the Internet was for communication purposes. However, its immense prospect as a learning tool was already acknowledged among. Furthermore, the recent years have witnessed the increasing eagerness of governments of diverse nations (both developed and developing) towards the prospects of online learning in the provision of education that is up-to-date, easily accessible, as well as cost effective, for the citizens from all walks of life and location, at any time.

Meanwhile, the information and communication technology (ICT) has been swiftly expanding, and combined with the high computer literacy among learners, the emergence of this innovative education format is possible. In the last 2 decades, computer-based training was in use, and it encompassed the usage of CD-ROMs and LANs in obtaining information. Then, after a decade, the use of Internet management systems and education took over, and the term e-learning was consequently introduced.

The way people perform their task has been changed by technology, and in the context of education, there have also been transformations. Accordingly, children cannot be trained with the skills of the past if they were to become effective people in future. At the same time, educators must be given opportunity to employ the relevant tools in their teaching.

At current time, mobile learning or M-Learning is expansively used in the domain of education.

E-Learning encompasses the application of interactive technologies and communication systems with the purpose of enhancing the experience of learning. The use of e-Learning can potentially change the way teaching task is executed, and also how the process of learning occurs. It also contributes to the increase in standards while also expanding the involvement in lifetime learning. Somehow it should be noted that educators (teachers and lecturers) cannot be replaced by e-Learning, rather, e-Learning can increase the teaching coverage and quality, while also decreasing the time expended on administration. With e-Learning, each learner could reach his or her prospect. Consequently, this learning method can assist in the creation of an educational workforce that is empowered to change, and for future learning society, e-Learning is truly an ambitious education system.

People are currently living in the Information Age which requires them to become knowledge workers. Meanwhile, the requirement for manual workers is progressively decreasing. In this modern society marked by the Information Age, lifelong learning is vital in the assurance of continued success. In this regard, e-Learning is arguably the sole possible answer to the issues relating to the delivery of resources for the lifelong learning assistance.

2. Discussion

Distance education has been long established, and this type of learning is marked by the division of distance and time between educator and learning [1]. Accordingly, the birth of e-learning novel distance learning methods through its application of computer technologies. Alongside e-learning, there are other formats

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of online learning which are still in use, including satellite-distance learning.

From another side, Mobile learning is a technique of e-learning and therefore part of distance learning, as shown in figure one. In the literatures there are different definitions of distance learning. Some consider them wireless or Internet only. We believe that the definition of distance learning must include the ability to learn everywhere at every time without a permanent physical connection to the network cables. This can be achieved through the use of portable and portable devices for example PDAs, cell phones, laptops and tablet [2]. They must have the ability to connect to other computers, to provide educational information and to achieve bilateral information exchange between students and teachers.

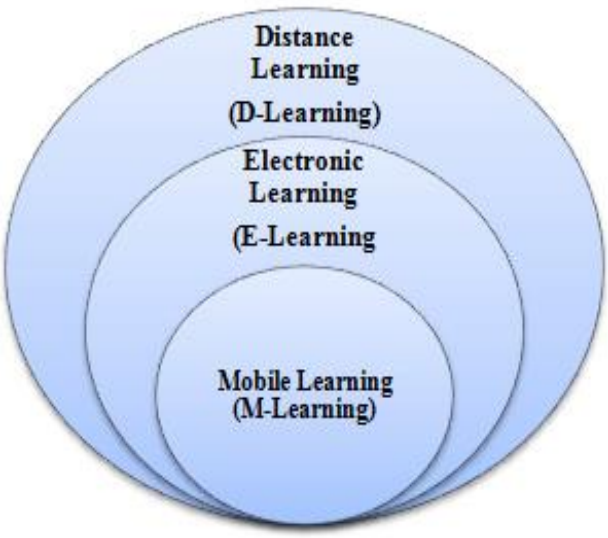


Figure1: a location of M-Commerce in D-Learning Environment

By the looking at the potential of mobile learning by following statistical information on the number and growth of mobile phones, Personal Digital Assistant (PDA), Smartphone and mobile users:

More than 70% of the workplace in the USA is mobile [3]. Up to this moment all over the world sold over 500 million Mobile Phones with Web Capabilities [3]. The number of mobile phones sold in Europe was 25% in the first quarter of 2004 [3]. The number of PDAs and smart phones sold was more than 200% 10 years ago [4]. Each quarter of the software development companies for mobile devices increases by 1000 [5]. By 2005, the number of mobile handsets sold (PDAs and smart phones) will exceed the number of PCs sold [6]. The total number of worldwide internet users from 2005 to 2017. As of the most recent reported period, the number of internet users worldwide was 3.58 billion, up from 3.39 billion in the previous year [7]. For the time being the number of internet users is3.773 billion that representing 50% of the total population of the globe [8]. In 2010the users for wireless Internet exceeded 1 million users. Until 2014 there will be more than 4.917 billion mobile users [9].

3. Results

Mobile learning requires the use of mobile devices, and in this regard, several devices have been regularly employed for mobile learning purposes. Each of these devices may differ in terms of their capabilities, sizes and prices, but they all have mobility and can be employed for making wireless connections. Accordingly, the primary types of or portable devices employed in the domain of education include laptops, tablets, PDA, cell phones, and Smartphone. Each is as elaborated below:

Laptops functions like the desktop PC, but they are smaller in size and some may be fairly heavy. Laptops are portable, meaning that they can be carried around (unlike desktop PC). Also, laptops generally support wireless communication. In general, laptops are expensive [10].

Tablets are among the newest portable devices, with a full range of competencies including those of personal computers. Some Tablets are not equipped with keyboard but are equipped with a program for handwritten text recognition. Similar to laptops, Tablets are fairly costly [11].

PDA is a small size device and yet it is equipped with very powerful processor. The newly released PDA can display more than 65,000 colors. It can also recognize handwritten text while also supporting multimedia files of diverse types. For PDA, its primary OS are Palm and Microsoft Pocket PC [12].

Cell phones are devices of Low-level, and these devices are mainly used for voice dialing and for conveying and receiving text messages (SMS). Among the shortcomings cell phones are low rate of data transfer and low memory size. On the other hand, with the use of the technology of WAP or GPRS, high-end mobile phones can access the Internet. Multimedia messages (MMS) can also be delivered and received through these high-end phones. At current time, the prices of cell phones are decreasing gradually [13].

Smartphone encompasses a multi-purpose mobile computing device. As opposed to feature phones, Smartphones have greater hardware capabilities and more expansive mobile operating systems, and therefore, Smartphones can support more software, and more expansive usage of internet such as web browsing. Furthermore, Smartphones are generally equipped with multimedia functionality allowing users to enjoy music, view video, use cameras, and play games. As for phone functions, they are similar to cell phones. Smartphones may also be equipped with different sensors of diverse types such as accelerometer, barometer, magnetometer, proximity sensors, and gyroscope [14]. More importantly, Smartphones can be used for wireless communications protocols such as Wi-Fi, Bluetooth, and satellite navigation [14].

Accordingly, the types of learning devices can be classed into 4 major categories. Each of these categories has both advantages and disadvantages. In this regard, Table presents the brief information regarding these categories alongside their advantages and disadvantages:

Table1: E-Learning devices classification

Type	Description	Pros	Cons
Desktop	Comprises CPU (tower), a monitor, keyboard and mouse. Mounted on a desk at home, office, classroom, or computer lab.	- Judiciously priced. - Greater options for upgrade, and easier component addition, leading to sounder performance. - Suitable for editing video and photo. - Suitable for for high-end 3D gaming. - Connection checks, cleaning, and repairing are easier to perform. - Easy to print documents and pictures	- Immobile. - Necessitates bigger space.
Laptop	A contrivance with a built-in keyboard and mouse track	- Portable – can be brought along during travels.	-Might be heavy albeit the small size. - Frequently is

	pad; small in size making it highly portable.	- Needs very minimal space. - Consumes less amount of electricity. - Functions just like a desktop and can run the common software programs.	much more expensive compared to a desktop computer. - Sometimes it does not have speed or performance as high as the high-end desktop. - Impossible to add parts (e.g., motherboard, graphics card, etc.). - Repair may be difficult. - Direct printing documents and pictures from the laptop may be difficult to perform.
Tablet	A small computer-like apparatus; smaller than a computer and larger than a Smartphone with touch screen abilities.	- Highly portable and very lightweight. - Small enough to conveniently fit in a purse or backpack. - A good additional portable device to user. - Easy to use. - Suitable for basic needs, e.g., checking email, and social media. - Allows easy access to TV, music, movies, and eBooks.	- May not be suitable for actual work (e.g., typing documents) because typing on on-screen keyboard is not easy. - Processing power less than a desktop or laptop. - Smaller screen size. - Smaller storage space. - Some could not run the common software programs. - Difficult to obtain saved files, or directly print documents and pictures from the tablet.
Smartphone	A mobile phone equipped more innovative computing competency and connectivity.	- Most are cheaper compared to a desktop, laptop or tablet. - Can be connected to the Internet with the availability of data plans and reception from a cell tower. - Suitable for basic needs, e.g., checking email, and social media. - Allows easy access to TV, music, movies, and eBooks.	- Difficult to view video and reading content due to small screen and font. - Does not include the common software programs or only has the basic versions that do not allow comprehensive use. - Much smaller on-screen touch keyboard than that of computer or tablet causing difficulty in typing. - More difficult to complete class assignment or directly print documents and pictures using Smartphone.

A number of communication technologies are employed in mobile devices, and these technologies have different capacities and range of data transmission. Among them is Global System for Mobile communications (GSM). Specifically, GSM comprises a standard established by the European Telecommunications Standards Institute (ETSI). It describes the protocols for second-generation digital cellular networks that are employed by mobile devices (e.g., Smartphones).

Wireless Application Protocol (WAP) launched in 1999, encompasses a technical standard used in the evaluation of information transmitted through a mobile wireless network. Accordingly, a WAP browser encompasses a web browser for mobile devices with the use of protocol. WAP gained fame in the early 2000s. However, the emergence of more modern standards in 2010s caused WAP to gradually lose its popularity. At current time, the internet browsers of the majority of new mobile phones fully support HTML. Hence, WAP markup for web page compatibility is no longer necessary. For this reason, most new mobile phones cannot display pages written in WML which is the markup language of WAP.

General Packet Radio Service (GPRS) which was established by European Telecommunications Standards Institute (ETSI), encompasses a packet oriented standard of mobile data on the 2G as well as 3G cellular communication network's global system for mobile communications (GSM). GPRS was created following the former packet-switched cellular technologies of CDPD and i-mode. At current time, the 3rd Generation Partnership Project (3GPP) maintains GPRS.

Bluetooth encompasses a standard of wireless technology that employs short-wavelength UHF radio waves within the ISM band from 2.400 to 2.485 GHz. It is used for the exchange of data across short distances from fixed and mobile devices. Also, Bluetooth is a vital technology in the formation of personal area networks (PANs).

IEEE 802.11 encompasses a standard created by the IEEE (Institute of Electrical and Electronic Engineers), and it entails a kind of radio technology for wireless local area networks (WLANs).

Wi-Fi (802.11) contains a number of standards within diverse frequencies of radio. In general, for wireless LANs operating in the 2.4 GHz spectrum with a bandwidth of 11 Mbps, the standard is 802.11b, whereas for wireless LANs, the standard is 802.11a. All these are for systems operating within the range of frequency of 5 GHz with 54 Mbps bandwidth.

Infrared Data Association (IrDA) which was introduced in 1993 by approximately 50 firms, encompasses an industry-driven interest group. IrDA makes available the specifications for a comprehensive set of protocols of wireless infrared communications, and the name itself actually refers to the given set of protocols. IrDA is used for wireless data transfer over the "last one meter" grounded upon the principles of point-and-shoot. IrDA is implemented in portable devices (e.g., cameras, laptops, mobile phones etc.). Among the key characteristics of IrDa include tangibly secure data transfer, Line-of-Sight (LoS), as well as very low Bit Error Rate (BER). Hence, the efficiency of IrDa is very high.

The aforementioned technologies are usable in the provision of diverse rates of data transmission with the range up to 100 meters within hot spot arenas such as higher learning institutions (e.g., colleges and universities). Accordingly, cell phones that support WAP and/or GPRS technologies have to be employed, in order to attain higher ranges.

As opposed to e-Learning, the application of m-Learning is not bound by time or place. Also, as m-learning involves the use of mobile devices, it is worthy to note that mobile devices are generally less expensive as opposed to desktop PCs. Apart from that, mobile devices are much smaller in size and is also lightweight. The use of m-Learning is also easy because it requires a device that is also used daily by students, that is, a mobile phone. Additionally, the use of GPS technology in mobile device allows m-Learning to offer location dependent education.

However, issues have indeed emerged in regards to the use of portable devices in m-Learning. Relevantly, Table 3 presents the aforementioned issues in addition to their potential solutions.

The comparison between parameters of existing wireless technologies is given in table2:

Table2: The existing wireless technologies

Technology	Data Rate (Mb/s)	Range (Meters)	Frequency Band
Bluetooth	1-2	100	2.4
IrDA	4	1-2	Infrared
IEEE 802.11a	54	20	5 GHz
IEEE 802.11b	11	100	2.4 GHz
IEEE 802.11g	54	50	2.4 GHz

These technologies can be used to provide different data transmission rates with range less than 100 meters in the hot spot area like university. To achieve higher ranges the cellular phonessupporting WAP and/or GPRS technologies must be used.

The benefits of M-learning compared to E-learning such as it can be used everywhere at every time;most of mobile devices have lower prices than desktop PCs;smaller size and light weight than desktop PCs;ensures bigger students' engage as m-Learning is based on modern technologies,which students use in everyday life;using GPS technology the m-Learning can provide location dependent education.

Regarding to the existing problems of using portable devices inM-Learning and their potential solutions are shown in the following table3:

Table3: M-Learning problems andpossible solutions

No.	Problem	Possible solution
1	PDA and cell phone have small screen, and this restricts the information display capacity.	1.
2	2.	The application of wireless technologies that allow the transmission of video data to the computer or TV monitors as support to these technologies.
3	PDA and cell phone have small keyboards causing difficulty in inputting information.	The use of virtual keyboard.
4	PDA and cell phone have inadequate memory size.	The use of flash memory cards (e.g., Toshiba micro HDDs with 64 GB maximum capacity)
5	Frequent charging requirement of batteries, almost on a daily basis.	The application of methanol fuel cell technology by Toshiba, as is already used for laptops.
6	The incompatibility of desktop PC applications with mobile devices.	The use of universal operating system for mobile devices, e.g., Motion eXperience Interface (MXI) by RADIXS company.
7	Difficulties in the utilization of multimedia components in cell phones, particularly video montage and video editing.	The application of next generation communications.

As e-learning has transformed into M-learning, the model of education has also transformed. Such transformation has led to the necessity for transformation in educational methods as well as in communication between teacher and students.

4. Conclusion

Although there are shortcomings associated with it, m-Learning will increase in popularity as ICT is continually progressing. The customary usage of m-Learning with the conventional education will fulfil the requirements for the enhancement of educational quality. Also, the flexibility of educational process will increase, while satisfying the demands of lifetime learning. For the disabled individuals, the application of M-Learning also can guarantee good educational prospects.

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